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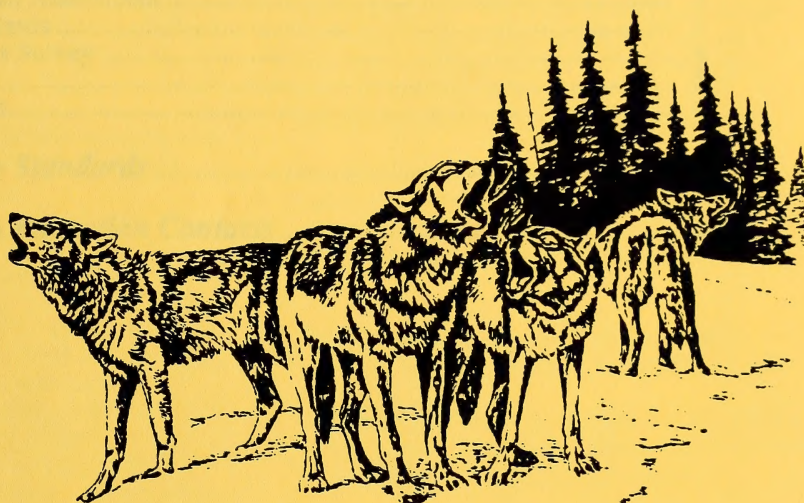


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Student Achievement Testing Program Bulletin

Grade 9 Science



1992-93 School Year

This bulletin contains general information about the 1993 Achievement Testing Program and information specific to Grade 9 Science Assessment. Additional copies of the bulletin may be obtained by telephoning Alberta Education at 427-0010.

DISTRIBUTION: Superintendents of Schools • School Principals and Teachers • The Alberta Teachers' Association • Alberta School Boards Association • Officials of Alberta Education • General Public upon Request

September 1992

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General Information

The Achievement Testing Program provides Alberta Education, school jurisdictions, schools, and the public with information significant at the provincial and local levels about what students know and can do in relation to the specific learner expectations of the *Program of Studies*. It does not provide information to be used for student placement or promotion.

The assessments are administered on a four-year cycle in four subject areas—language learning, social studies, mathematics, and science—and at three grade levels—3, 6, and 9.

Classroom teachers from across the province participate in developing and field testing the assessment instruments.

Administering the Assessment

Information about the nature and administration of the provincial assessments, about exemptions, special provisions, and about students receiving instruction in French can be found in the *Achievement Testing Program General Information Bulletin, 1992–93 School Year*, which has been mailed to all superintendents and principals.

Schedule

Schools will administer the 1993 assessments according to the following schedule:

Tuesday, June 8

Grade 3 Language Learning
Part A: Writing (a.m.)

Grade 6 Social Studies (a.m.)

Grade 9 Science (a.m.)

Wednesday, June 9

Grade 3 Language Learning
Part B: Reading (a.m.)

A French translation of the social studies and science assessments is available and must be administered at the same time as the English version. Alberta Education will send enrolment forms to schools by February 1993 requesting an indication of which version, English or French, is required. These forms must be returned through jurisdiction offices by March 5, 1993.

Reporting the Results

In September 1993, each school jurisdiction will receive a district profile and school reports for their students' achievement, as well as guidelines for interpreting these results in relation to provincial standards.

To facilitate reflection on school programs, we expect that results will be shared with school staff (not just teachers of grades 3, 6, and 9) as well as with parents and the community.

We also expect that Individual Student Profiles will be shared with parents.

In December 1993, provincial results will be made public through the annual *Achievement Testing Program Provincial Report*.

Broadened Assessment Initiatives

During the past year, the Student Evaluation Branch developed new instruments to collect a broader base of information. These assessments will provide a more complete picture of what students know and can do. These new instruments were administered to a sample of students in the spring of 1992:

Grade 3

- participation skills in social studies
- "whole book" performance-based assessment in language learning

Grade 6

- performance tasks in mathematics and science
- listening and viewing skills in language learning

Grade 9

- performance tasks in mathematics and science
- listening and viewing skills in language arts

Additional assessments are planned for 1993.

Grade 9 Science Assessment

General Description

The Grade 9 Science Assessment is designed to reflect the content and skill learner expectations in the *Program of Studies, 1991*.

The achievement assessment instrument (machine scored) consists of two parts:

Part A has 70 multiple-choice questions each with a value of one mark.

Part B has 5 numerical-response questions each with a value of one mark.

Students are to record their answers on a separate answer sheet.

Students will have a maximum of two hours to write the test. We suggest that those students who finish writing before one hour has elapsed remain at their desks to review their answers.

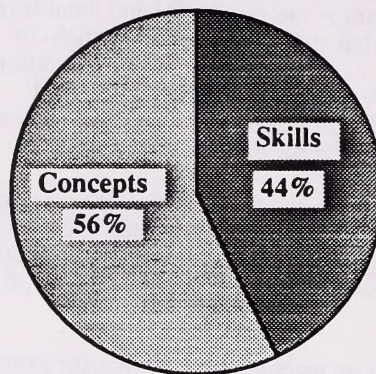
Students will need HB pencils, erasers, and scrap paper.

Content

This assessment is based upon the six units in the program of the Grade 9 Science course of studies in which nature of science; science and technology; and science, technology and society are integrated components.

The learning domains, concepts and skills, are integrated in the assessment. The skills domain consists of inquiry skills,

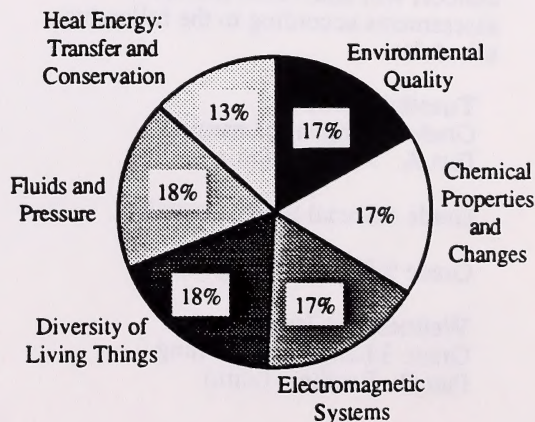
technological problem-solving skills, and societal decision-making skills. The weighting for each domain is shown in the following circle graph:



The subject matter component is divided into six assessment components to reflect the units of study in the Grade 9 Science *Program of Studies, 1991*. These assessment components are:

- 9.1 Diversity of Living Things
- 9.2 Fluids and Pressure
- 9.3 Heat Energy: Transfer and Conservation
- 9.4 Electromagnetic Systems
- 9.5 Chemical Properties and Changes
- 9.6 Environmental Quality

The weighting given to each assessment component is shown in the following circle graph:



Performance-Based Assessment

Performance-based assessment provides real life problem-solving activities. This assessment addresses the learner expectations in the current *Program of Studies* that cannot be assessed by means of machine scorable instruments. It provides a broader picture of what students know and can do. In 1993, randomly selected Grade 9 students from a sample of schools throughout the province will participate in this assessment. Six to eight hands-on assessment activities will be used in a station format: after completing an activity, students move on to a different activity. Although there is no time limit, students are encouraged to complete each activity within 10 to 15 minutes. Schools selected to participate in this assessment will be notified in April 1993.

The emphasis for each program area is presented by topic in the following table:

**Performance-Based Assessment
Program Area Emphasis by Topic**

Topic	Program Area		
	N of S	S and T	STS
1. Diversity of Living Things	✓		
2. Fluids and Pressure		✓	
3. Heat Energy: Transfer and Conservation		✓	
4. Electromagnetic Systems		✓	
5. Chemical Properties and Changes	✓		
6. Environmental Quality			✓

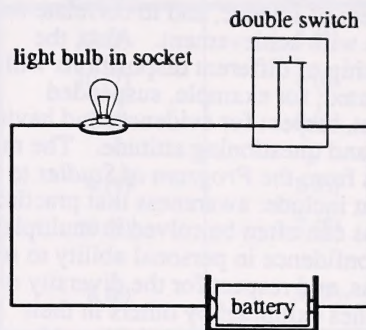
N of S - Nature of Science

S and T - Science and Technology

STS - Science, Technology, and Society

Sample PBA Activity

George and Rita found a circuit board in the attic of the garage. They put a new battery in the battery holder and a new light bulb in the socket. When they flipped the switch, the light would **not** go on. Using the materials provided, find the problem and fix it. Show your method and solution in the space provided.



Extra Materials:

3 wires with alligator clips; 1 bulb and socket; 1 battery and holder.

Confirming Standards

Confirming standards is a process whereby judgments about students' performance on the assessment are made in relation to provincial standards. For more information on confirming standards procedures, refer to Appendix A of the *Achievement Testing Program Provincial Report, June 1991 Administration*. For information on the selection of teachers for participation in the confirming standards process, refer to the *Achievement Testing Program General Information Bulletin, 1992-93 School Year*.

Learning Contexts Survey

In 1993, learning context survey questionnaires will be given to a sample of Grade 9 teachers and students.

The purpose of the student questionnaire is to examine the extent to which the attitudes outlined in the *Program of Studies* are evident, to look at student attitudes toward the subject of science, and to correlate these attitudes with achievement. Also, the relationship of different dispositions will be investigated; for example, suspended judgment, respect for evidence, and having a curious and questioning attitude. The main attitudes from the *Program of Studies* to be looked at include: awareness that practical problems can often be solved in multiple ways, confidence in personal ability to solve problems, and respect for the diversity of approaches exhibited by others in their search for solutions to practical problems.

The purpose of the teacher questionnaire is to study the effect on student achievement of the classroom environment, a variety of instructional strategies, different approaches to scientific investigations and problem-solving, and the participation of students in various activities.

Blueprint

The emphasis for each assessment component and learning domain are presented in the blueprint.

Blueprint 1993 Grade 9 Science Assessment

Assessment Component	Per Cent of Course and Number of Questions	Per Cent Emphasis and Number of Questions ¹	
		Learning Domain	
		Concepts	Skills
1. Diversity of Living Things	18 (13)	12 (9)	6 (4)
2. Fluids and Pressure	18 (13)	10 (7)	8 (6)
3. Heat Energy: Transfer and Conservation	13 (10)	7 (6)	6 (4)
4. Electromagnetic Systems	17 (13)	9 (7)	8 (6)
5. Chemical Properties and Changes	17 (13)	10 (8)	7 (5)
6. Environmental Quality	17 (13)	8 (6)	9 (7)
Total	100 (75)	56 (43)	44 (32)

¹The number of questions on the test may vary slightly from those indicated in the learning domain.

The relative emphasis of question contexts for each program area is indicated in the following table.

Program Area Emphasis by Topic

Topic	Program Area		
	Nature of Science	Science and Technology	Science, Technology and Society
1. Diversity of Living Things	A	C	B
2. Fluids and Pressure	A	A	C
3. Heat Energy: Transfer and Conservation	A	A	C
4. Electromagnetic Systems	B	A	C
5. Chemical Properties and Changes	A	B	C
6. Environmental Quality	A	B	A

A—High Emphasis

B—Moderate Emphasis

C—Low Emphasis

Sample Questions

Sample questions that reflect the nature and complexity of the questions that will appear on the 1993 Science Assessment are presented on the following pages.

We encourage teachers to familiarize students with the assessment by having them work through these sample questions. A practice answer sheet for the numerical-response questions is provided on page 17 so

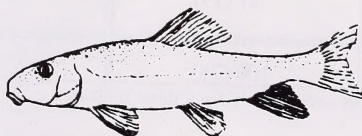
that students can familiarize themselves with this new form. Please note that this collection of sample questions does not represent the assessment emphasis as presented in the blueprint.

Questions 1 to 13 are multiple-choice questions. Questions 14 and 15 are numerical-response questions.

Question 1

Use the following information to answer question 1.

Tom observed some fish at an aquarium. One looked like this.



1. In its natural habitat, this fish lives
- *A. at the bottom of a shallow lake
 - B. near the surface of a shallow lake
 - C. just above the weeds along the shore of a deep lake
 - D. midway between the surface and bottom of a deep lake

Curriculum Standard: The student is able to infer environmental conditions for which particular structures are adaptive.

Concept: 9.1.1 (c) Diversity of Living Things

*The asterisk indicates the correct response

Question 2

2. A biologist was photographing a *Felis leo* in Africa. The Linnaean classification categories that are used for this organism's scientific name are
- A. Order Class
 - B. Class Genus
 - C. Order Species
 - *D. Genus Species

Curriculum Standard: The student is able to describe the Linnaean classification system.

Concept: 9.1.4 (a) Diversity of Living Things.

Question 3

Use the following information to answer question 3.

The oil in the heavy oil fields near Cold Lake is often too thick to pump from underground. Workers inject superheated steam into the formations so the oil can be pumped out.

3. This procedure works because the viscosity of liquids
- A. decreases with an increase in water content
 - B. increases with an increase in water content
 - C. increases with an increase in temperature
 - *D. decreases with an increase in temperature

Curriculum Standard: The student is able to predict the effects of temperature changes on viscosity of fluids.

Concept: 9.2.1 (d) Fluids and Pressure

Question 4

4. Sandy observed smoke rising from a birthday candle. Air around a candle flame rises because
- A. air particles lose energy
 - B. air particles become lighter
 - C. air becomes a vacuum next to the flame
 - *D. air becomes less dense than the surrounding air

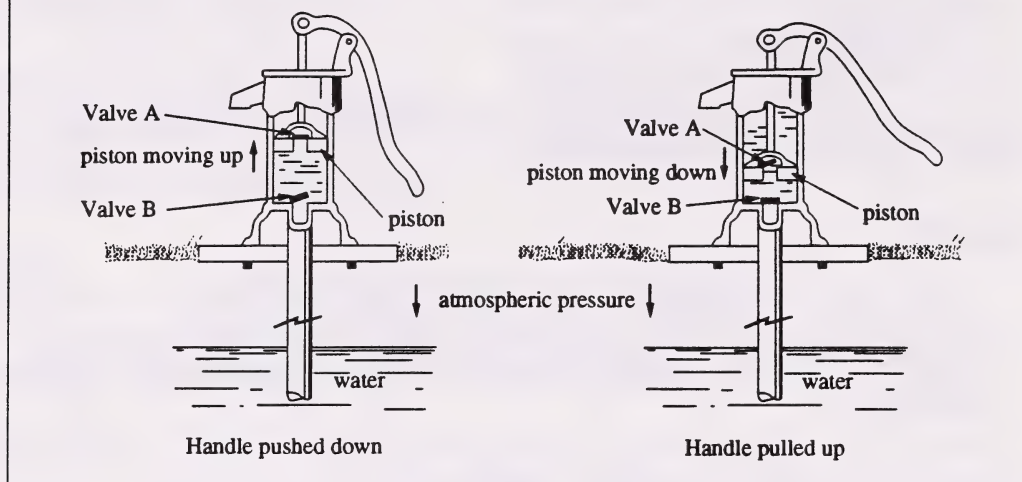
Curriculum Standard: The student is able to identify and interpret applications of heat convection.

Concept: 9.3.3 (e) Heat Energy: Transfer and Conservation

Question 5

Use the following information to answer question 5.

A farmer uses a lift pump to water horses. The diagram shows how a lift pump operates.



5. The function of valve A is to

- *A. remain closed when the piston is pulled up, thereby lowering pressure so that the water rises
- B. remain open when the piston is pulled up, thereby lowering pressure so that the water rises
- C. remain closed when the piston is pushed down, thereby preventing water from moving down into the well
- D. remain open when the piston is pushed down, thereby allowing water to move down into the well

Curriculum Standard: The student is able to interpret the operation of a pump.

Concept: 9.2.4 (g) Fluids and Pressure

Question 6

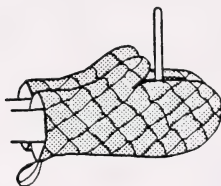
6. A lab technician is finding the quickest method to heat milk samples. There are four tubes, each with 20 mL of milk and at a temperature of 20°C. The technician holds each tube for five minutes. The rise in temperature would be quickest in the tube shown in

A.

*B.

C.

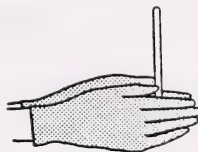
D.



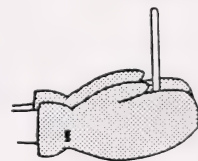
oven mitts



bare hands



cotton gloves



down-filled mitts

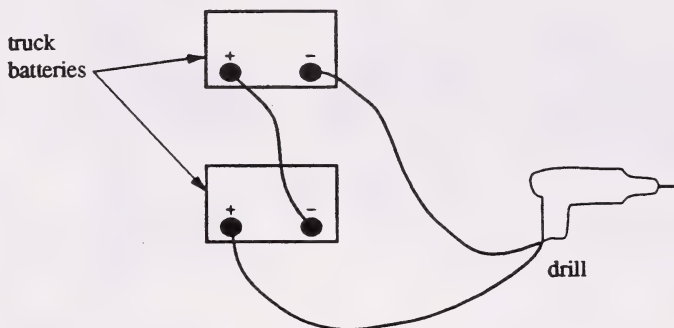
Curriculum Standard: The student is able to compare and predict the effectiveness of alternative materials and approaches to insulation in domestic applications.

Concept: 9.3.4 (d) Heat Energy: Transfer and Conservation

Question 7

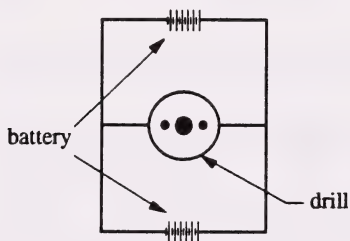
Use the following information to answer question 7.

A mechanic has a power drill that operates on a 24-volt power supply. The mechanic and her helper have two trucks, each of which operates from a 12-volt wet cell battery. In order to operate the power drill, the mechanic hooked it up to the truck batteries, as shown:

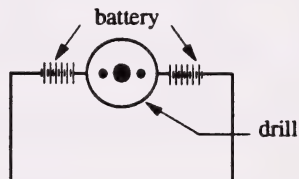


7. The schematic diagram that shows the circuit that will work best is

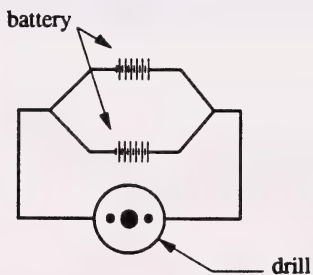
A.



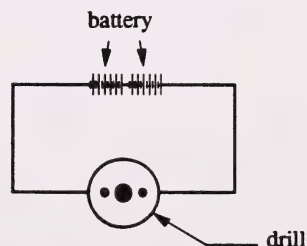
B.



C.



*D.

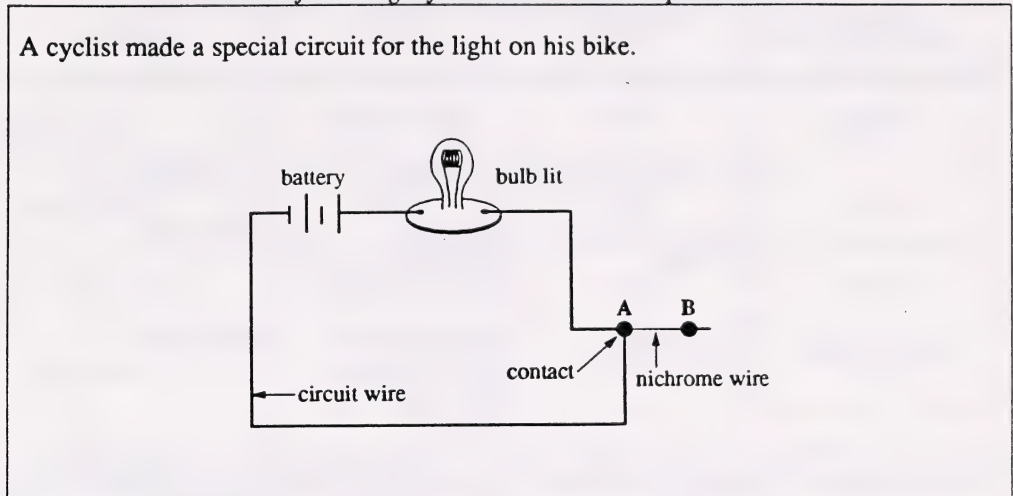


Curriculum Standard: The student is able to construct and interpret circuit diagrams.
Concept: 9.4.4 (e) Electromagnetic Systems.

Question 8

Use the following information to answer question 8.

A cyclist made a special circuit for the light on his bike.



8. If the circuit wire is moved from contact point A to contact point B, the bulb will

- *A. dim
- B. brighten
- C. burn out
- D. not change

Curriculum Standard: The student is able to describe the effect of resistance on electron flow in a simple circuit.

Concept: 9.4.5 (b) Electromagnetic Systems

Question 9

Use the following information to answer question 9.

The table shows observations made when a few drops of various liquids were added to four powders.			
Powder	Liquid Added		
	Water	Iodine	Vinegar
Baking Soda	liquid sinks into powder	liquid stays reddish-brown and sinks into powder	liquid fizzes
Baking Powder	liquid fizzes	liquid turns from reddish-brown to blue-black and fizzes	liquid fizzes
Cornstarch	liquid sinks into powder	liquid turns blue-black and sinks into powder	liquid sinks into powder
Talc	liquid beads on top of powder	liquid turns orange and beads on top of the powder	liquid beads on top of powder

9. A baker found an unlabelled can of white powder. When he adds vinegar to the unknown powder, the powder fizzes. Based on the information in the table, which conclusion about the unknown powder is valid?
- A. The powder is baking soda, and no more information is needed.
 - B. The powder could be cornstarch, but more information is needed.
 - *C. The powder could be baking soda, but more information is needed.
 - D. The powder is baking powder, and no more information is needed.

Curriculum Standard: The student is able to analyze information in order to distinguish between different household materials on the basis of physical and chemical properties.

Concept: 9.5.4 (c) Chemical Properties and Changes

Question 10

Use the following information to answer question 10.

Indicators	Acid	Base	Neutral
Red Litmus	Red	Blue	Red
Blue Litmus	Red	Blue	Blue
Phenolphthalein	Colorless	Pink	Colorless
Congo Red	Red	Blue	Blue

10. A scientist tested an unknown household cleaner. Colorless phenolphthalein did not change color when added to a sample of the cleaner. The scientist could infer that the unknown household cleaner was
- A. a base
 - B. an acid
 - C. a base or neutral
 - *D. an acid or neutral

Curriculum Standard: The student is able to identify the presence of acids and bases in household products.

Concept: 9.5.3 (e) Chemical Properties and Changes

Questions 11 and 12

Use the following information to answer questions 11 and 12.

Ms. Beetle's Grade 9 class was concerned about the quality of water in Poplar River. They carried out a water quality study by sampling freshwater invertebrates from five different locations along the Poplar River. The results are shown below.

Name	Number of Freshwater Invertebrates				
	Upstream of STP*	1 km downstream of STP*	20 km downstream of STP*	50 km downstream of STP*	100 km downstream of STP*
Mayfly Larvae	256	2	26	163	228
Beetles	26	13	16	18	23
Caddisfly Larvae	48	2	8	30	46
Worms	14	164	120	56	18
Leeches	19	98	54	30	20

*STP = Sewage Treatment Plant

11. From these data, the **best** inference is that

- *A. all invertebrates are affected by the Sewage Treatment Plant
- B. fishing would be better upstream from the Sewage Treatment Plant
- C. only worms and leeches are unaffected by the Sewage Treatment Plant
- D. the entire invertebrate population is unaffected by the Sewage Treatment Plant

Curriculum Standard: The student is able to interpret (make inferences) the quality of an environment in terms of the variety of life forms it supports.

Concept: 9.6.2 (b) Environmental Quality

12. At what point downstream from the Sewage Treatment Plant will the invertebrate population be **about the same** as the upstream population?

- A. 1 km
- B. 20 km
- C. 50 km
- *D. 100 km

Curriculum Standard: The student is able to identify patterns in a set of data.

Concept: 9.6.2 Environmental Quality

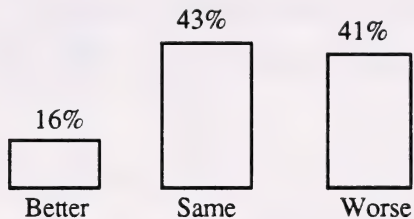
Question 13

Use the following information to answer question 13.

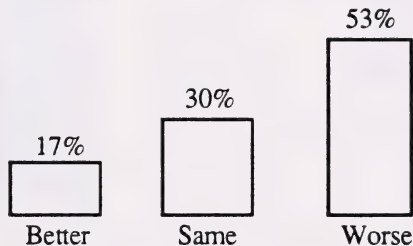
ENVIRONMENTAL QUALITY POLL

A group of students conducted an environmental survey because a number of industrial plants are being built in their community. Two of the questions and the percentage of answers are shown below.

1. Is the quality of the environment you live in better, worse, or about the same as it was five years ago?



2. What you think the quality of the environment you live in will be like five years from now?



13. These results reveal that most people feel that the environment

- *A. will be worse five years from now
- B. will be better five years from now
- C. has become better in the past five years
- D. has become worse in the past five years

Curriculum Standard: The student is able to interpret data and identify considerations, perspectives, and trade-offs that contribute to the decision-making process.

Concept: 9.6.5 (b) Environmental Quality

Sample Instruction Page for Numerical-Response Questions

Instructions:

1. In this part of the assessment, there are two numerical-response questions, each with a value of one mark.
2. Read each question carefully.
3. Write your answer in the boxes on the answer sheet, beginning in the left-hand box. Then carefully fill in the circles that match your answer.
4. Ignore the decimal point unless the question indicates otherwise.
5. Use an HB pencil only. If you wish to change an answer, please erase your first answer completely.

Examples

1. Red Litmus paper was used to indicate whether four solutions found in a kitchen were acidic or basic. The results are shown in the table below.

Solution	Colour of Litmus Paper
1	pink
2	neutral
3	red
4	blue

Record the order of the solutions from most acidic to most basic.

Answer: 3, 1, 2, 4

3	1	2	4
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
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<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

2. On the line provided, place the number that matches the diagram of a specific stage of the butterfly metamorphosis.

1.



2.



3.



4.



egg

larva

pupa

adult

Answer: 2, 1, 4, 3

2	1	4	3
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
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<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Practice Answer Sheet for Numerical-Response Questions

1	2	3	4
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
0	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9
5	6	7	8
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
0	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9
9	10	11	12
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
0	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9

Question 14

14. A zoo worker stored bird feed according to feeding habits. Place the number of the bird on the line above the feeding habit that its beak is best adapted for.

1. Duck



2. Cockatoo



3. Hawk



4. Heron



Answer:

Cracking seeds

Catching fish

Straining Food

Tearing flesh

RECORD YOUR ANSWER IN THE NUMERICAL-RESPONSE SECTION OF THE ANSWER SHEET

Curriculum Standard: The student is able to make inferences about animal structures that play a role in locomotion, securing food, and avoidance of predators.

Concept: 9.1.1 (c) Diversity of Living Things

Key: 2, 4, 1, 3

Question 15

15. A builder was researching the performance of different materials used to insulate homes. The RSI (insulation) value of four building materials is shown in the table below.

Material Number	Material Name	RSI per Centimetre
1	polystyrene	0.35
2	wood	0.10
3	fibreglass	0.24
4	brick	0.014

Record the order, by material number, of the **best** insulator to the **worst** insulator of these four materials.

Answer: _____

RECORD YOUR ANSWER IN THE NUMERICAL-RESPONSE SECTION OF THE ANSWER SHEET

Curriculum Standard: The student is able to compare the effectiveness of alternative materials and approaches to insulation in domestic applications.

Concept: 9.3.4 (d) Heat Energy: Transfer and Conservation

Key: 1, 3, 2, 4

Science Performance Standards

Target Group

The Grade 9 Science course is intended for all students who have been determined by their teachers to be ready for the regular Grade 9 Science program after having successfully completed the Grade 8 program. The standards described below, inherent in the Grade 9 Science course, are for this target group.

Purpose of Performance Standards

The Grade 9 performance standards statements will help educators develop a shared, province-wide understanding of *acceptable* and *excellent* standards for Grade 9 Science.

These statements describe what is expected of Grade 9 students who are achieving the *acceptable* or the *excellent* standard on independent work at the end of the Grade 9 Science program. These statements represent the standards against which provincial and/or local levels of student achievement will be measured. By comparing actual provincial results to expected provincial standards, decisions can be made about whether achievement is in fact "good enough". The standards inherent in these statements are derived from the goals and objectives of Grade 9 Science as presented in the *Junior High Science Program of Studies, 1991*.

Acceptable Standard of Performance

Students who are achieving the *acceptable* standard in Grade 9 Science are expected to have a basic understanding of the conceptual and procedural knowledge that is essential to the Junior High science program. For example, they can easily apply concepts and basic procedures in simple and familiar situations in which they have had previous experience, but they are challenged when applying these concepts and procedures to

unfamiliar or complex situations. Students may be able to identify the name of an organism in a classification system, for example, but have difficulty interpreting the relationship of organisms at the same classification level.

For their performance to be considered *acceptable*, students are expected to know how to apply higher level thinking skills in familiar situations. However, they have difficulty applying these skills in new or unfamiliar situations. For example, they can predict the effects of linking a familiar and identical electrical load in series or parallel circuit, but many have difficulty predicting the effects of linking different or unfamiliar types of electrical loads in these circuits. They can use basic skills to show what they know and can do in novel real-life problems that are simple or that require single-step solutions. Also, they can apply more advanced skills or follow multi-step procedures to solve familiar real-life problems in which they have had prior experience. For example, in a problem-solving activity to find the best insulating material, these students will be able to develop a simple and controlled procedure, collect a set of data, and determine the best insulator. However, their procedures will likely not have more than one manipulated variable and may lack a complete and logical explanation of results.

Students achieving the *acceptable* level of performance generally have a positive attitude toward learning about the world in which they live. They appreciate how science and technology affects them on a day-to-day basis. They are skilled in using the basic procedures of science inquiry, technological problem-solving, and societal decision-making; however, they have difficulties with the application of more advanced skills and have limited ability to make connections between science, technology, and society.

Standard of Excellence

Most students who achieve an *excellent* level of performance in Grade 9 Science have a superior understanding of the

essential conceptual and procedural knowledge outlined in the *Program of Studies*. They can quickly and confidently apply this knowledge in complex and novel situations. For example, not only can they identify the abiotic factors that affect the health and distribution of living things, they also can predict the possible outcomes of changing abiotic factors on living things and evaluate their effects on the quality of the environment.

Students achieving the *excellent* level of performance are able to apply higher level thinking skills to unfamiliar situations. In addition, they can easily and quickly solve problems they have direct experience with and that require single-step or multiple-step solutions. These students can solve a problem in more than one way and can see more than one solution for some problems. For example, not only are they familiar with the basic operation of an electric motor, but they can troubleshoot an inoperative motor, make design changes to meet varying performance criteria, and construct a working motor.

Students achieving the *excellent* level of performance have a positive attitude about science and its role in their world. They are curious, open-minded, creative, and confident. In addition, they are persistent problem-solvers and have the ability to view a situation from a number of perspectives. Not only do they have a high level of awareness and understanding of how science and technology affects them personally, they can translate this understanding and awareness to societal issues. They are skilled in using the basic procedures of science inquiry, technological problem-solving, and societal decision-making. They can successfully use advanced skills and make connections between science, technology, and society.

Appendix A: Alberta Education Contacts

Questions or comments regarding this
bulletin should be directed to:

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